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ABSTRACT

Comanche's mutation system, at first glance a relatively simple one, poses the following problems of analysis for both: (1) the variation in phonological substance manifested by the mutating segments themselves; and (2) the larger contextual pattern within which this mutation takes place. Comanche appears to exhibit a slightly skewed but typical variety of consonant mutation for which an insightful floating feature analysis might be expected. Such an account is approached and contrasted with a feature changing approach, specifically the parameter framework advocated by Archangeli. Contains 18 references. (LB)

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COMANCHE CONSONANT MUTATION: Initial Association or Feature Spread?

James L. Armagost

Abstract: Comanche initially appears to exhibit a slightly skewed but typical variety of consonant mutation for which one should expect an insightful floating feature analysis if claims for this approach are valid. I attempt such an account and contrast it with a feature changing approach, specifically the parameter framework recently advocated by Archangeli. I argue that the latter is superior.

Any analysis of mutation must attempt to account for two aspects of the phenomenon, namely (i) the variations in phonological substance manifested by the mutating segments themselves and (ii) the larger contextual pattern within which this mutation takes place. Comanche's mutation system, at first glance a relatively simple one, poses interesting problems of analysis for both (i) and (ii).

Morpheme initial consonants exhibit the mutation pattern shown in (1).[1] Refer to table 1 on the next page for examples.

(1) a. p t c k k^w
b. ^hp ^ht ^hc ^hk $^hk^w$
c. β ɾ

By hypothesis, selection between series (a), (b) and (c) depends on some phonological property of the preceding morpheme. A morpheme final skeletal position can be filled only by a glide or vowel. Morphemes with a final /h/ or /ʔ/ predictably induce series (c). All others may induce any of the three series. Mutation occurs after both morpheme and word boundaries, but at the beginning of a phonological phrase bounded by pauses the only option is the series (a) unaspirated stops. I will refer to (b) as the preaspirated stop series. The exact status of these consonants has been questioned, some studies taking them to be clusters, i.e. [hC] (Canonge 1957; Miller 1973; Armagost 1988a, 1988b), others suggesting a single segment analysis (Riggs 1949). The

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	stop		preaspirated stop	
1a.	*hipa?a* 'on what'	1b.	*huuʔpa?a* 'on a log'	
2a.	*puni* 'to see'	2b.	*waciʔpuni* 'to spy on'	
3a.	*sookɛ́* 'much, many'	3b.	*wahaʔkɛ́* 'two'	
4a.	*tenaníí* 'men'	4b.	*nanaʔtenaníí* 'male relatives'	
5a.	*nakituku* 'the same ear'			
6a.	*cuni* 'to hang suspended sg.'	6b.	*wíʔtani* 'to throw over a line'	
7a.	*nakɛ́aki* 'to come in sight'	7b.	*taʔkɛ́a* 'to drive out pl.'	
8a.	*kʷe?ua* 'to shed'	8b.	*taʔkʷe?ua* 'to take off shoes sg.'	

voiced spirant

1c.	*papiβa?a*	'on a head'
	nakiβa?a	'on an ear'
	tíʔka?βa?a	'on a table'
2c.	*naβuni*	'to see REFL'
3c.	*tɛɛʔpíʔɾɛ́*	'child'
4c.	*na?ɾenaʔpíʔ*	'male relative'
5c.	*mo?oɾuku*	'the same hand'

Table 1: Morpheme initial obstruents other than [s]

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stop		preaspirated stop	
1a.	*papi* 'head'	1b.	*ʔɨʰpɨi* 'to sleep sg.'
2a.	*ʔotɨ* 'brown'	2b.	*kʷɨʰti* 'to shoot sg.'
3a.	*pacɨʔ* 'older sister'	3b.	*huʰtuuʔ* 'bird'
4a.	*pika* 'buckskin'	4b.	*piʰka* 'to make a drumming sound'
5a.	*yɨkʷi* 'to sit pl.'	5b.	*paracɨʰkʷeʔe* 'to shine'

voiced spirant

1c.	*paβɨʔ*	'older brother'
2c.	*kaɾɨ*	'to sit sg.'

Table 2: Morpheme medial obstruents other than [s]

question forms a major thread running through this paper. In keeping with normal Numic usage, (c) may be referred to as the voiced spirant series despite the fact that [ɾ] is a tap. The strong asymmetry between (a,b) and (c) is given an appealing historical explanation by McLaughlin in work soon to be published. Finally, table 2 includes some examples to suggest that all the consonants of (1) are in superficial contrast within morphemes, though medial [ʰkʷ] is not at all common.

The consonants in (1) can be seen as the skewed manifestation of a basic five-position stop system found in a number of languages (Hockett 1955:102). Current autosegmental theories allow a number of possibe analyses. Before turning to a feature changing approach, which I will argue is superior, I will attempt to account for (1) through initial association of floating features in an analysis inspired by Lieber's treatment of Chemehuevi (1987:84-7), a related Southern Numic language. The full underlying consonant and vowel system of Comanche would be as follows, where capitals represent the source of (1) underspecified for various features:

(2)	P	T	C		K	K^w	
		s					
	m	n					
				y		w	h,ʔ
				i	+	u	
				e	a	o	

Hypothesizing for mutation series (1b) the single segment rather than cluster analysis, as introduced above, (1a,b) can be accounted for by allowing [spread] to function as a floating feature. I assume left to right, one to one initial association along with a timing mechanism whereby [+spread] is realized as <u>pre</u>aspiration in stops. This value is also lexically present in the maximally underspecified /h/. Example (3a) gives the lexical entry for a morpheme having an initial /h/ and a medial preaspirated stop. The notation essentially follows Lieber's, with IPA transcription used informally for all melody features except [spread] and capitals continuing to be used for the source of series (1). Initial association and filling in of predictable values for underspecified [spread], i.e. [0spread], give (3b).

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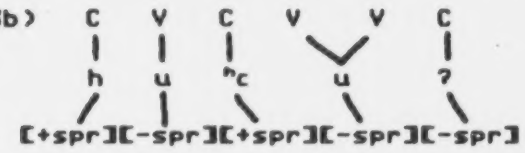
(3a) C V C V V C *huʔuuʔ* 'bird'

h u C u ʔ

[+spr][0spr][+spr][0spr][0spr]

(3b)



Turning now to an example of influence across a morpheme boundary, (4) gives a lexical entry consisting of a verb root preceded by an instrumental prefix.

(4) *taʔkɨa* 'to drive out pl.'

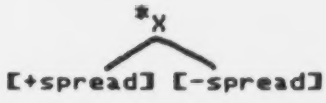
C V C V V

T a – K ɨ a

[0spr][0spr][+spr] [0spr][0spr][0spr]

The verb root in citation form has [k], i.e. the default value for [spread]. This default value cannot be assigned in (4) prior to association of [+spread] from across the boundary or the following ungrammatical contour would result.

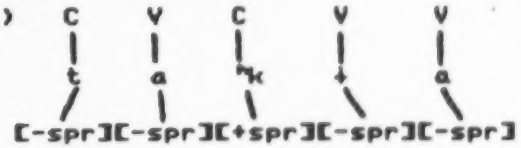
(5)



A contour constraint blocking association of [+spread] after default assignment would give incorrect *[taɨa]. Lieber does not address the mechanics of this problem in any substantial way, but merely leaves the mutation tier blank for such morpheme initial segments, i.e. [ ], with no association line except that from across the boundary. But it is clear that we need something to serve as a morpheme initial place holder on the mutation tier to guarantee correct lining up of second autosegments with second skeletal positions, etc. This problem is a manifestation of the extent to which the supposed autosegment is not an autosegment. In order to push the floating feature analysis through, I will assume [0spread] as above and cyclic initial association. On the second cycle [+spread] in essence

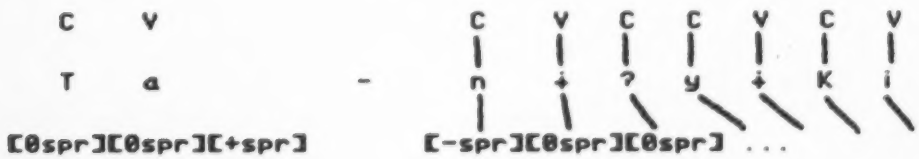
fills in the underspecified [0spread] in the root initial segment.[2] Only at some later point in the derivation will default values be assigned to any remaining unspecified features. In the word initial [t], [-spread] is by this mechanism. Lexical entry (4) thus surfaces as (6).

(6)



Since it is only the stops (and [h]) that are [+spread], initial association to other segments must be prevented. Within Lieber's framework this is accomplished by lexically prespecifying or preattaching for /n/, etc. the value [-spread] (see Archangeli 1988b: 795 for criticism). In (7), an intermediate point in a derivation, the above prefix is seen before a segment with this preattached feature.

(7) *tanɨʔyɨki* 'to make a sound of footsteps'



On the prefix cycle docking of [+spread] is prevented by the constraint on contours. Eventual deletion of such unassociated features results in surface [n]. This approach unfortunately requires extensive lexical attachment of what would otherwise be default values for [spread]. It also fails to distinguish such 'irregularity' from true lexical exceptions such as the invariant form [ʰta] 'obj.', which has a [+spread] stop even when suffixed to a spirantizing form such as [puhihwi] 'money': [puhihwiβai] 'to have money', but [puhihwiʰta] 'money obj.' Lieber intends lexical attachment to be costly, and this should presumably explain the fact that there are only a few forms like [ʰta].

Turning now to the spirants of consonant series (1c), the relevant mutation feature(s) must be identified. The optimal floating feature analysis would hypothesize surface [r] to be from [ð̞] by a late rule.

thus allowing analysis of the spirants as intermediate /β, ð/. These then differ from the corresponding series (1a) stops in two features, [voice] and [continuant]. Note that for the segments in (1) and (2) there are implicational relationships between these features: only the nonnasal [+voice] segments are continuants and only the nonstrident continuants are [+voice] (again taking [ɾ] to be intermediate /ð/). Hypothesizing both [voice] and [continuant] as mutation features (as Lieber would presumably do) therefore predicts non-occuring phonetic realizations unless one constrains intratier feature specifications prior to initial association and default assignment. If we take just one of the features to underlie spirantization, then the predictable values for the other can be supplied by default following initial association.

Lieber proposes no constraints on selection of mutation tiers, but formalizations of segment internal feature geometry such as that in figure 1 on the next page, which I now assume for the remainder of this paper, can suggest motivated choice. If [+voice] is the feature that causes spirantization of stops, then the entire set of consonants in mutation series (1) can be attributed to the laryngeal node rather than to the interplay of two or more unrelated features. As in most languages the third laryngeal feature is severely constrained in Comanche, which has only a single [+constricted] segment. There may still be unexplained phonetic gaps, however, if values for [voice] and [spread] can be restricted in the lexicon only by duplicating the statement of certain default values assigned to morpheme medial segments after initial association.

Shown in (8) is part of the derivation of *naɾ+noo?* 'saddle' (/na[+voice]/ 'reflexive', /T+/ 'indef. obj.', /noo[+voice]/ 'to carry', /?/ 'nominalizer'). Initial association has applied on the penultimate cycle in (8a). The final cycle, eventual assignment of default values to unspecified features including [continuant], and a late feature changing rule for [ɾ] give (8b) as the surface form. (In order to simplify representation in this example I have omitted the laryngeal node and show [voice] and [spread] docking in a slightly misleading manner. Note that while Lieber's framework would require lexical attachment of [-spread] and [+voice] in nonmutating initial segments such as /n/, /?/ could be unspecified for [spread] since unwanted docking of [+spread] could

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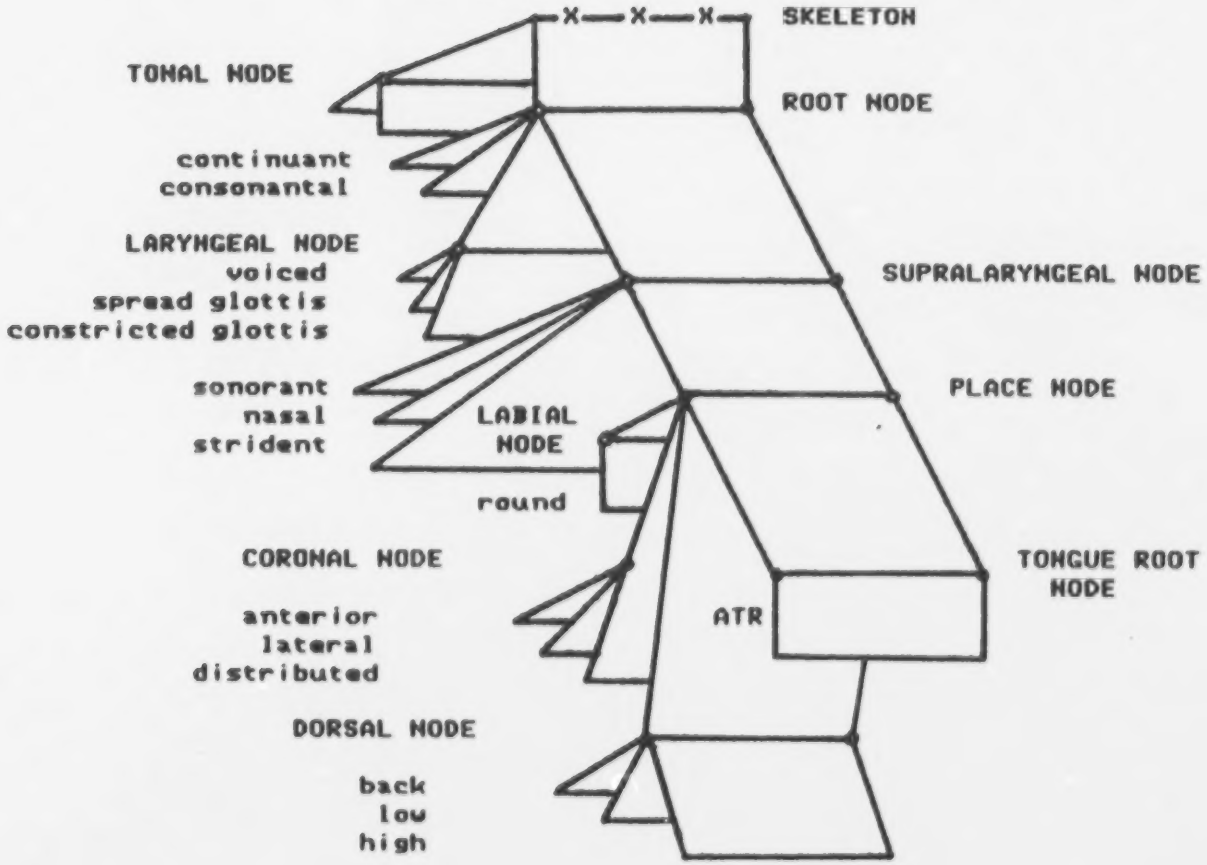
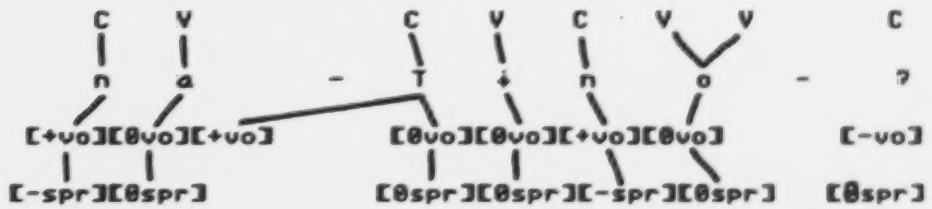


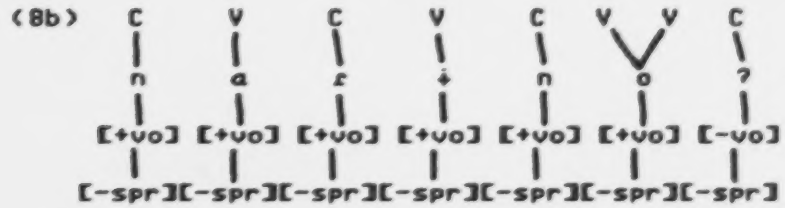
Figure 1. Feature hierarchy (Clements 1985, Sagey 1986, Ladefoged and Halle 1988, and others)

be prevented by a universal constraint blocking [+constricted, +spread]. But similar blocked docking of [+voice] in /ʔ/ would require giving up maximal underspecification of this segment as [+constricted].)

(8a) *naɛ́noo*ʔ 'saddle'

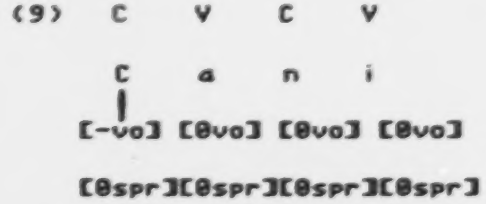


(8b)



Some account must be given of the fact that the only mutation series spirants are [β,ɛ]. There are two possible approaches to this sort of problem in Lieber's framework. One could block unwanted docking of [+voice] by preattaching [-voice] in all morpheme initial /C,K,K^{w}/. The lexical entry for [cani] 'to hang suspended sg.' would then be as in (9).

(9)



Alternatively, one could propose unrestricted docking of [+voice] across a morpheme boundary and a later rule to delink this feature in the three appropriate segments prior to the filling in of redundant [+continuant]. The value [-voice] could then be provided by default and the segments would remain [-continuant]. This was essentially the approach of Armagost 1988c.

Each of these alternatives requires a disjunction of features in order to distinguish the relevant segments and each involves other forms of complexity as

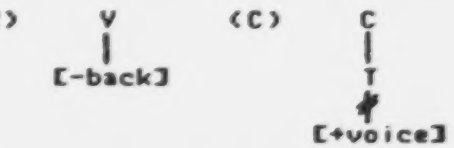
well. Though capable of mechanically cranking out the data, it is clear that neither could be claimed to provide any insight. Without attempting to justify a choice between the two, I will now turn to a final problem in the floating feature account of the spirant series. While [β] occurs in all spirantization contexts, [t] rather than [r] occurs if the preceding syllable has a front vowel. This is illustrated in (11) for the clitic postpositions /Pa?a/ 'on' and /Tuku/ 'same'.

(11)

	'on X'	'same X'
'buffalo'	*ta?siwɓo?βa?a*	*ta?siwɓo?ruku*
'table'	*ti^{n}ka?βa?a*	*ti^{n}ka?ruku*
'head'	*papiβa?a*	*papituku*
'ear'	*nakIβa?a*	*nakItuku*
'clubbed ones'	*wi^{n}tok^{m}e?βa?a*	*wi^{n}tok^{m}e?tuku*

These data appear to require a delinking rule along the lines of (12), whose application would be followed by assignment of the default value [-voice] to intermediate /T/, giving surface [t].

(12)



This completes the floating feature analysis on the assumption, stated earlier, that consonant series (1b) consists of single preaspirated phones rather than clusters of segmental [h] plus stop. Riggs (1949) defended this interpretation of (1b) though without reference to what may be the strongest evidence in its favor, the predictability at a fairly superficial level of what are commonly known as organic voiceless vowels. As (13) shows, unstressed vowels are devoiced by a following voiceless continuant which, if /h/, then deletes under various conditions (Armagost 1988b). Preaspirated stops have no effect on preceding vowels.

(13) *pukukɬni* 'barn' (cp. *kahni* 'house')
wana?ɬhi 'cloth blanket'
kutɬhora 'to dig a firepit'
?omomɬsi 'still by foot'
kakɬsa 'wing redup.'

pémɬsuʔa 'themselves also'
BUT: *waciʔpuni* 'to spy on'
puhihwiʔta 'money obj.'
kumaʔpéʔ 'husband'
yéɛéʔki 'to frighten'

Canonge (1957), however, in what amounts to an unconnected addendum to his defense of the supposed phonemic status of these vowels, argues that the consonants are in fact clusters and not unit phonemes. His most persuasive evidence is the existence of a definite, perceptible syllable division between the aspiration and the stop in both rapid and slow speech (notwithstanding the majority of relevant line breaks in Canonge 1958). It is certainly possible for the above floating feature analysis to account for Canonge's observation by means of a rule inserting a coda before preaspirated stops, with delinking of the aspiration and relinking to the new consonant. In order to maintain the predictability of organic voiceless vowels, coda insertion would be ordered after devoicing. Other things being equal, however, the advantage would clearly go to the analysis in which coda insertion and shifting of aspiration was not necessary.

If Comanche does not have unit preaspirated stops then some mechanism other than initial association of a floating feature must account for the difference in consonant series (1a,b), thus weakening the hypothesized parallel between preaspiration and spirantization. As we saw, however, there are independent reasons for doubting the floating feature analysis of spirantization itself. In the feature changing alternative we must still address two facts: [ɛ] is not a spirant and its distribution differs from that of [β], as in (11). These facts would be connected as direct consequences of an early rule shifting /T/ to [ɛ] when preceded by a back vowel (if there were no additional rule affecting /T/). Then spirantization would affect only certain occurrences of /P/ and would have nothing to do with [ɛ].

In what follows I assume radical underspecification and a highly restricted, parameterized approach to phonology, in particular that of Archangeli (1988a). Comanche's underlying consonant and vowel pattern is again that shown in (2). For the present we can assume that glottals are the only allowed codas, as is true phonetically. /ʔ/ is minimally specified [+constricted] and /h/, [+spread]. Looking first at consonant series

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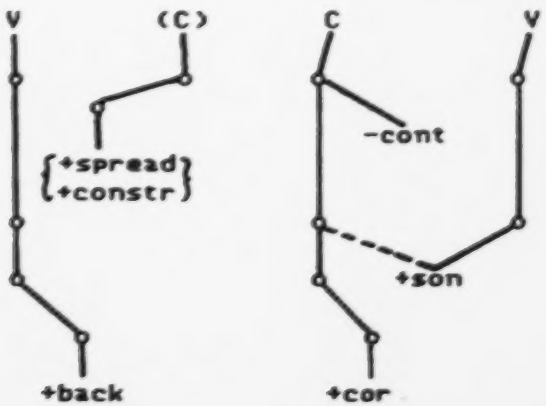
(1a,c), the tap formation rule (14) gives [ɾ] in a process unrelated to spirantization. In the framework adopted here a rule can affect only a single feature or node and the affected segment must be adjacent to any named environment, where adjacency is determined by the hierarchical organization of features given in figure 1 and the parameter 'level', which allows two options: scanning at prosody (maximal level) or at the node immediately dominating the feature or node undergoing the rule (minimal level). 'Argument' names the feature or node undergoing the rule, 'operation' names the process involved, 'trigger' names adjacent conditioning environment, and 'target' names intrasegmental conditioning environment.

(14) Tap formation

Level:	minimal
Operation:	spread left
Argument:	[son]
Trigger:	L = R = [+syll]; L = [+back]
Target:	[-cont,+cor]

Tap formation is illustrated in (15), which shows a possible glottal segment intervening between the back vowel and the affected /T/. (Refer again to (11) and table 1.)

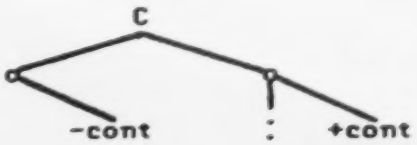
(15)



Note that since the intervening glottal is specified only for a laryngeal feature, all others being predictable, the segment is invisible when scanning takes place across supralaryngeal nodes and thus need not be mentioned in the rule, a desirable effect of this approach. As we saw above, [+voice] is predictable in [ɾ]. I assume also predictability of whatever other feature(s) may distinguish taps from stops, the

distinction perhaps being that of maintainable versus momentary stricture (Catford 1988:78), though this is a question on which there has been little consensus. Finally, since (14) is sensitive to the environment on the right of the affected segment, it automatically distinguishes /T/ from /C/, to which we do not want it to apply, assuming that the latter has the structure shown in (16) (following Sagey 1986 and others). Thus this aspect of tap formation is also free of cost.

(16)



Spirantization then is restricted to the labial stop, which must be converted to its voiced continuant counterpart. Unfortunately, choice of neither [voice] nor [continuant] as argument would allow a transparent intervening glottal segment, as desired. A partial remedy to this difficulty would be to view spirantization as the rightward spread of [+continuant] to /P/ from a preceding vowel or /h/, once these segments are provided the redundant value of this feature. No assimilation to /s/ could occur since such a consonant can only be an onset. But in this account of spirantization, the desired assimilation across an intervening /?/ would be blocked.

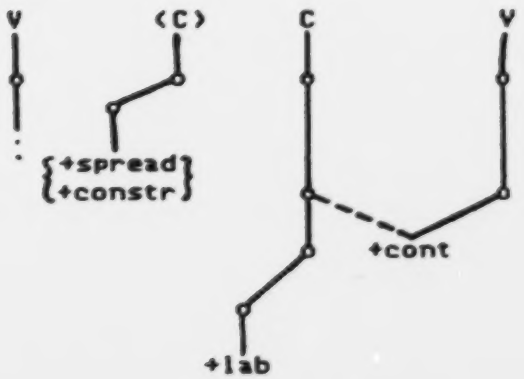
From the point of view of Comanche a more satisfying solution is to hypothesize that either [voice] or [continuant] is sufficiently low in the hierarchy to allow an intervening glottal at no cost. It is important to remember that while articulator based geometries such as figure 1 must have some pretheoretically satisfying fit with physiological fact, they are not linguistic givens. The feature hierarchy, like all other aspects of linguistic theory, can only be determined through careful hypothesis testing over a wide range of languages. These remarks logically apply equally to both [voice] and [continuant], but a priori one would certainly expect that [voice] should be a laryngeal feature. By contrast, continuants are not directly tied to the anatomy of a particular structure but result from some configuration of the entire oral tract. One would therefore expect the location of [continuant] in the hierarchy to be less easily determined, perhaps even variable across languages. The data suggest that in Comanche [continuant] is at least

as low as the supralaryngeal node. Spirantization of /P/ then can be stated as in (17), which is illustrated in (18).

(17) Spirantization

Level:	minimal
Oper:	spread left
Arg:	[cont]
Trig:	L = R = [+syll]
Targ:	[+lab]

(18)



Given the hypothesized location of [continuant], an intervening /h/ or /ʔ/ is now transparent, as desired. The output of rule (17), intermediate /ɸ/, falls into the class of sonorants and continuants and is predictably voiced, surfacing as [β]. (Both /s/ and the glottals are removed from this class by prior assignment of [-voice], predictable in these segments.)

Tap formation and true spirantization together account for all surface [ɾ] and [β] at relatively little cost. They also automatically account for [t] rather than [ɾ] following syllables with front vowels. The two rules overgenerate, however, since they deny the existence in phrase medial position of [p] and of [t] after back vowels. While an intervening glottal is transparent to both rules, their application would be blocked by an intervening coda having some specified feature sufficiently low in the hierarchy to be within the level of scanning, i.e. no higher than the supralaryngeal node. The fact that the only phonetic codas are [h] and [ʔ] can be directly accounted for by lexically restricting codas to /h/ and /ʔ/, as assumed to this point. But the facts can be accounted for indirectly by positing less constrained underlying codas along with a rule to eventually delete nonglottal codas.

The 'opaque consonant' cannot be identified as any of the underlying segments given in (2), suggesting that it is only very minimally specified for features at or below the supralaryngeal node, perhaps merely [-sonorant]. Lack of evidence for general default values for obstruent point of articulation features suggests that the blocking segment cannot occur as an onset but only as a coda. A citation form such as *papi* 'head' then has the structure /Pa[-son]Pi/ at the point where spirantization attempts to apply. Similarly, tap formation is blocked in /ʔa[-son]Ta/ 'other', which surfaces as *ʔata* .

The hypothesized [-sonorant] segment does not result in blocked organic devoicing, however. This is shown in (19) for /kɬ[-son]/, the causative-benefactive suffix. (The preaspirated [k] in both forms is interpreted as an [hk] cluster, as discussed above. A less definite future is marked by *-hutuʔI* , a more definite future by *-tuʔI* alone.)

(19) *nomohkakɬtuʔI* 'will hitch up (wagon) for'
(suffixes /kɬ[-son]-tuʔih/)
tɬhkakɬhutuʔI 'will cause to eat'
(suffixes /kɬ[-son]-hu[-son]-tuʔih/)

Organic devoicing, which is an assimilation to the voicelessness of a following /h/ or /s/, does not tolerate any intervening segments and therefore follows deletion of the minimally specified obstruent in (19). However, note that the preconsonantal [h] in these and similar forms does not induce devoicing but does block tap formation and spirantization, as in (20).

(20) *nacahpuni* 'to be tested'
nanahtena 'male relative'

This [h] is phonetically identical to the surface manifestation of the /h/ that induces organic devoicing, but is phonologically distinct from it. As can be seen, it shares three properties with the opaque obstruent appealed to above: it is a coda, it blocks tap formation and spirantization, and it does not induce organic devoicing. Lexically it appears to differ from the obstruent only minimally, being [+spread] while the latter is presumably [0spread].

The opaque obstruent hypothesized above thus appears to exist in two forms differing only in specification for [spread], a feature that until now was

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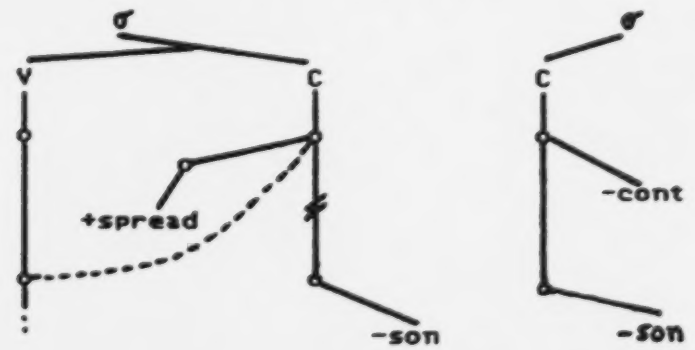
distinctive only for /h/. While in general restricted to medial and final codas, a handfull of irregular suffixes have the [+spread] version in morpheme initial position, e.g. *yakəhpíni* 'to cry much', with suffix *-hpíni* 'intensive'. If [0spread], the opaque segment is deleted by a rule ordered after tap formation and spirantization, as we saw above. If [+spread], its fate is more complex. Preceding a noncontinuant obstruent it surfaces as [h], but in all other contexts (phrase final or preceding a sonorant or /s/) it is deleted.

Its manifestation as [h], as opposed to some other phonetic reality, can be seen as virtually cost free once the grammar contains the following dissimilation rule.

(21) Obstruent dissimilation
Level: minimal
Oper: delink
Arg: supralaryngeal node
Trig: [-son, -cont]
Targ: [+spread]

This rule creates a segment identical to a lexically underspecified /h/. Assuming conventional assignment of predictable values for the other laryngeal features, and conventional assimilation to the supralaryngeal node of the preceding vowel, this segment surfaces as [h]. No process has disturbed its status as a coda, however, as shown in (22).

(22)



Summarizing the spreading analysis of mutation series (1), /T/ following a back vowel undergoes tap formation rule (14) and surfaces as [ɾ], and spirantization rule (17) affects only /P/. The possible presence of an intervening transparent /h/ or /ʔ/ need not be mentioned in either rule, but an intervening

opaque obstruent coda results in blocked application. This segment, when [+spread] and preceding /P,T,C,K,K^{W}/, surfaces as an [h] with the desired properties of a phonetic coda, but not until after organic devoicing is triggered by underlying /h/ and /s/. Vowels followed by preaspirated stops are therefore unaffected by organic devoicing. Deletion of remaining obstruent codas, whether [+spread] or [-spread], follows. This gives a distribution in which [h] before a sonorant is from /h/ but [h] before a stop is from [+spread,-sonorant].

While initially appealing, the attempt to account for (1) by hypothesizing a floating feature complex is most likely misguided. Such an analysis accounts for the distribution of [β] and [c] only in a clumsy way. The account of preaspiration would remain attractive if one could maintain the fiction that preaspirated stops are single phones and not consonant clusters, for this would result in a very straightforward analysis of organic voiceless vowels. On the other hand, the spreading analysis of spirantization is quite elegant, especially in the parameterized framework adopted here. The spreading analysis of preaspiration makes for a slightly more complicated account of the distribution of vowel quality but this seems well worth the cost since it avoids a dubious process of consonant slot insertion and transfer of aspiration from stops to this slot. Overall then, while this analysis differs in detail from others for Comanche, it does reaffirm the traditional approach involving Central Numic 'final features' as presented by Miller (1973), McLaughlin (1987), Charney (1988) and others.

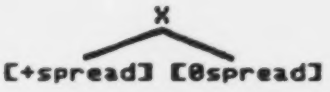
NOTES

1. In this paper the term 'Comanche' refers to that form of the language recorded in Canonge's materials and my own limited fieldwork. Slightly different varieties are found elsewhere, for example in Charney 1988. Notation is conventional ('c' = 'ts'), with stress marked only when it unpredictably falls on a noninitial syllable. Some of the material in this paper was presented before the 1988 Mid-America Linguistics Conference, Norman.

2. I am assuming that the following

pseudocontour is interpreted by general linguistic theory to mean [+spread], i.e. that [0spread] is automatically removed in this situation.

(i)



3. See Archangeli 1988a for similar arguments that [round] is a dorsal rather than labial feature.

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